FORM 1

COVER SHEET
NEW DEGREE PROGRAM PLANNING NOTIFICATION OF INTENT
(PLANNING NOI)

Program Information

Program Name: Bachelor of Science in Mechanical Engineering

Institution Name: Eastern Washington University

Degree-Granting Unit: College of Science, Mathematics, and Technology

Degree: B. S. Mechanical Engineering Level: Bachelor Type: Science

Major: Mechanical Engineering CIP Code 14.1901

Minor: NA

Concentration (s): NA

Proposed Starting Dates: Fall 2010

Projected Enrollment (FTE) in Year One: 25 At Full Enrollment by Year: 2013: 70

Proposed New Funding: $256,000

Funding Source: ☒ State FTE ☐ Self Support ☐ Other

Mode of Delivery

☒ Single Campus Delivery Cheney, WA

☐ Off-site

☐ Distance Learning

Substantive Statement of Need (Attached)

Contact Information (Academic Department Representative)

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Endorsement by Chief Academic Officer Date

I. Documentation of Need for Program

1.1 Justification

A recent report states that "The US share of the world's science and engineering graduates is declining rapidly as European and Asian universities, particularly from China have increased Science and Engineering degrees while US degree production has stagnated (Freeman, Richard B., *Does globalization of the scientific /Engineering Workforce Threaten US Economic Leadership?*, 2005). "Why isn't the U.S. more serious about the key competitive advantage of the Info Age, education? How to make human capital more valuable is no mystery, yet the world's richest country still has nowhere near the world's best education system. That means trouble that will only get worse". (Fortune, *The global Fight for Top Talent*, December 7, 2007). China graduates four times as many engineers as the US and Japan graduates almost twice as many engineers with less than one-half the US population.

Figure 1. (AEA's "Losing Competitive Advantage", US NSF, US Department of Education, and US Bureau of Labor Statistics) below indicates that while jobs in high tech grew by 2 million, high tech degrees stagnated. At the same time engineering degree production has fallen since the 1980's but has risen slightly over the past five years as can be seen in Table 1.

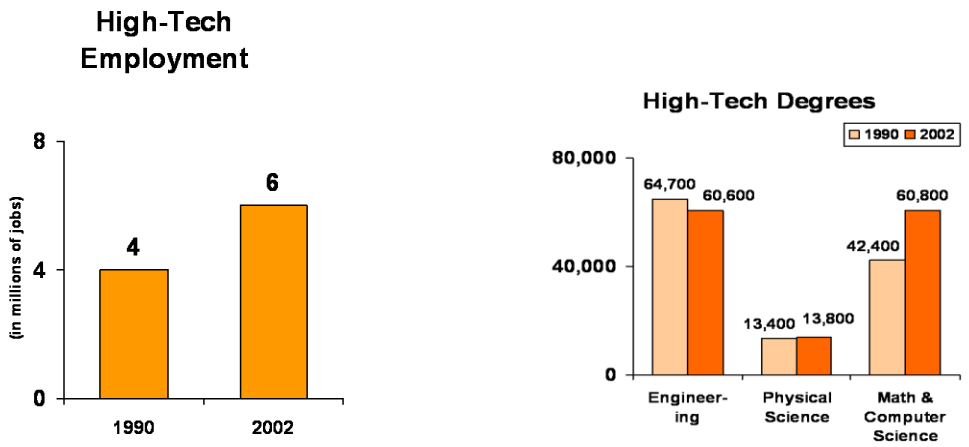

Figure 1. Losing Competitive Advantage (AEA 2008)

Table 1. Engineering degree production

	1985	1989	1993	1997	2001	2003	2005	2006	2007	2008
Engineering	77,571	66,947	62,670	62,352	59,258	63,773	66,133	67,671	66,869	68,206

BSME graduates are in demand as is demonstrated by the high level of the starting salaries--$57, 821 as indicated by the National Association of Colleges and Employers in 2008. The Association (Spring, 2008) further stated that BSME graduates are most in demand of any field. The article stated that retirement was one of the leading causes of this high demand of BSME graduates. Mechanical engineering job growth is second only to electrical engineering (American Society for Mechanical Engineers, 2008). Statewide vacancies in mechanical engineers are 284 needed now plus a projected annual need of more than 200 positions (Bureau of Labor Statistics). 160,000 engineers will be needed between 2006-16, an 11% increase (Bureau of Labor Statistics). At the same time, BSME student demand is not being met due to capped enrollments at the University of Washington. The University of Washington graduates less than 100 mechanical engineers yearly, and had more than 300 applications to the mechanical engineering program this year. WSU-Pullman graduated 88 BSME Spring 2008 with 90 student applications in 2007. This fall they plan to enrollment approximately 90 new students. WSU-Tri-cities graduates about 10 mechanical engineers.

In order to better assess student demand for such a program, a survey was undertaken from students in the Pre-engineering transfer program at Spokane Falls Community College at the end of the 2008-09 academic school year. The Pre-engineering program is a 2-year program that prepares students to transfer to a 4-year institution to

complete an engineering bachelor's program in various engineering disciplines. The survey was given to students in both the first and second years of the 2-year program. 55% of those taking the survey said that they were considering a degree in Mechanical Engineering. Out of those 55%, a full 75% said that they would consider Eastern Washington University as their institution of choice to complete their Mechanical Engineering degree if EWU had an Mechanical Engineering program in place. Additionally, a survey was given in a senior course in the mechanical engineering technology (MET) program at EWU. In this survey, students that were already in the MET program and were getting ready to graduate were asked if they would have chosen to major in ME over MET if EWU had such a program in place when they started their studies here. The results of this survey were that 88% of these students responded they would have majored in the mechanical engineering program instead of the MET program if they had been given the option.

EWU approached the Washington State Legislature in 2002 to allow Bachelor of Science in Electrical Engineering (BSEE) programs to be taught at additional universities. House Bill 1808 was approved and signed into law by the governor on July 27, 2003. The HECB approved the EWU BSEE program for the Cheney campus and EWU BSEE program began in the Fall Quarter 2005. EWU planned for 15 juniors and seniors but by 2009 there were 102 majors and 14 graduates. All graduates are employed but one who is enrolling in graduate school. The Program has now received it's ABET accreditation. The BSEE program has been a very successful program. EWU would now like the opportunity to offer another engineering program—the Bachelor of Science in Mechanical Engineering. EWU has offered an ABET accredited Bachelor of Science degree in Mechanical Engineering Technology for more than two decades. This program currently has 127 majors. Industrial contacts already exist creating more opportunities for applied research. Five BSME faculty are in place. EWU has a high rate of first generation students creating opportunities for underserved students as well.

The need for Mechanical Engineering within the region and state will exceed the current structures' ability to keep up with the demand for qualified personnel. As the state and the nation turn to high-tech solutions of our current problems the demand for Mechanical Engineering graduates will continue to grow at an even faster pace. Mechanical engineers have a place in almost all types of industry. For example, increased development of high-tech entertainment equipment relies upon mechanical engineers to develop physical testing standards and procedures. Mechanical engineers are also involved in the development of the manufacturing processes used to create and supply a wide variety of new items. The NY Times, June 17, 2008 indicated that the BSME is in high demand due to the need of increased internet data centers. For that and many other reasons almost all industries are quickly becoming dependent on mechanical engineers, who will design, manufacture, and/or develop upgrades to their systems. The aftermath of 9-11 has resulted in increased applications of the engineering sciences to defense and warfare systems and has established a greater workforce need in government and defense as well.

Increasing the number and quality of students in the field of mechanical engineering will help Washington State meet its economic development goals and, in fact, EWU's Mechanical Engineering program will provide an essential step in this process. Most economic studies for eastern and western Washington identify the continued strengthening of these regions' infrastructure for high technology business and industry as a major economic development strategy. For example, a May 2003 study by the Seattle-based Technology Alliance (*Drivers for a Successful Technology-Based Economy: Benchmarking Washington's Performance*) states that we should be keeping up with our peer states in terms of technology but we are not. The State of Washington ranks down the list among its peers in three key areas—education, research capacity and entrepreneurial environment. The Report states, "The number of bachelor's degrees granted overall, and particularly in science and engineering majors, is in the lowest third of the nation on a per capita basis." It further states that technology thrives in states where education systems stress science and engineering, producing technologically sophisticated workers. A 2006 Report (*Drivers for a successful Technology-Based Economy: Benchmarking Washington's Performance, A Technology Alliance Report, July 2006*) further stated that "Washington's position has deteriorated on this indicator in recent years."

A 2007 study by the same organization notes that there is a "glaring disparity between the number of graduates we are producing to support our innovation economy and the number of degree holders working in Washington in [high demand] fields." Further, the report states that Washington State ranks 37th in production of bachelor's degrees in science and engineering.

Washington State has many electronic, software, and engineering companies such as Boeing, Itron, Wagstaff, Agilent Technologies, INTEL, Triumph, Fluke, Telect, Bayliner, Schweitzer Engineering, Bremerton Shipyards, Pacific Northwest National Laboratory, AVISTA, Bonneville Power Administration, the Hanford complex, and Haaken Industries that need a technologically well-educated workforce. These and other companies in the state and region including many consulting firms and state agencies currently employ EWU graduates in a variety of technical fields and they continue to request graduates with solid backgrounds in mechanical engineering and the ability to integrate engineering processes with mechanical design.

The American Electronics Association (AeA), the nation's largest technology trade association, reported in *Cyberstates 2007: A Complete State-by-State Overview of the High-Technology Industry,* that Washington's high-tech industry added 4,500 jobs for a total of 156,500 in 2005 ranking it 14th in the nation. Washington State had 6,800 high-tech establishments in 2005, ranking it 17th nationwide and 8th in electromedical equipment manufacturing employment with 3,500 jobs. In addition, a 2002 AeA evaluation of the need for engineers in Washington State concluded that eight of the ten fastest growing jobs in America over the next ten years require high tech degrees. Degrees must triple to keep up with job opportunities. But, on-the-other-hand the Washington State's institutions of higher education graduate fewer high-tech degrees now than ten years ago.

"Washington still faces a number of challenges going forward. We are not graduating enough scientists and engineers to maintain this growth," says Jeff Severs, former CEO of SprayCool in Spokane (Cyberstates 2007). "Go to the websites of Washington's technology companies – large and small – and you'll find thousands of positions going unfilled because companies cannot hire enough qualified graduates from our universities and they cannot recruit talented foreign nationals due to visa restrictions. This does not bode well for the state's economic future. Cyberstates 2007 further says that nationally the high-tech industry is becoming stronger. High-tech employment was up by 146,600 out of 5.8 million workers in 2006, the second year in a row that the U.S. tech industry has added jobs.

The US Bureau of Labor Statistics' *Occupational Outlook Handbook 2008-09 Edition* (http://www.bls.gov/oco/ocos027.htm) provided the following statistics for mechanical engineering:

- **Mechanical engineers** are projected to have 4.2 percent employment growth over the projections' decade. New job opportunities will be created due to emerging technologies in biotechnology, materials science, and nanotechnology. Additional opportunities outside of mechanical engineering will exist because the skills acquired through earning a degree in mechanical engineering often can be applied in other engineering specialties.

- National data obtained indicates that between 2006 and 2016 58,000 (~12,000/year) mechanical engineers will be needed due to growth and total replacement needs. This data is detailed in Table 2.

Table 2. Long Term Mechanical Engineering Projections

Employment*	**Total Employment 2006**	**Total Employment 2016**	**2006-2016 change in total employment**	**2006-2016 Percent change in total employment**	**2006-2016 average annual job openings due to growth and total replacement needs**
Mechanical Engineering	226,000	235,000	9,000	4.2	12,000

*(source: http://www.bls.gov/emp/emptabapp.htm)

The most recent statistics from Workforceexplorer (June 2009) show that need for Mechanical Engineering employment will grow annually by 1.2% in Spokane County, 1.3 % in eastern Washington, and 1.0 % in

Washington State between 2012 and 2017. The total number of mechanical engineers expected to be employed in the state by 2017 is 6,789. This data is detailed in Table 3.

Table 3. Long Term Occupational Projections

Estimated Employment*	**2007**	**2012**	**2017**	**Annual Avg. Growth 2007-12**	**Annual Avg. Growth 2012-2017**	**Avg. Annual Total Openings 2007-2012**	**Avg. Annual Total Openings 2012-2017**
Washington State							
Mechanical Engineers	6,276	6,448	6789	0.5%	1.0%	162	221
Eastern Washington							
Mechanical Engineers	59	59	63	0.0%	1.3%	1	2
Spokane							
Mechanical Engineers	284	291	309	0.5%	1.2%	7	11

*www.workforceexplorer.com—data analysis—long term projections

Table 3 indicates that approximately 1105 additional mechanical engineers are needed in Washington State between 2012 and 2017. The existing Washington State mechanical engineering graduation rate cannot keep pace with this growth. Not all mechanical graduates take jobs directly into these 1105 positions as some attend graduate school, others are employed in related fields, while others start businesses.

The Washington Higher Education Coordinating Board's February 2006 State and Regional Needs Assessment Report has provided additional support for the addition of degree offerings:

- By 2010, the public colleges and universities must grow to accommodate an additional 45,000 FTE students to meet demand resulting from population pressure and increased demand for degrees.
- The higher education system must increase the number of graduates with the skills required to meet the employer needs in a number of key occupations. Institutions should develop strategies to increase the numbers of students prepared to fill positions in the high-demand areas of computer science, engineering, software engineering and architecture, and health care occupations.
- After a several year period of falling numbers of public high school graduates, the number of graduates will increase to greater than the number of graduates in 2007/8.
- 13% of undergraduate students in Washington are from out-of-state.
- Figure 8 of the Report indicates that fewer workers with lower training levels and more workers with higher levels of training are needed.

A report from Senator Maria Cantwell (http://cantwell.senate.gov/news/record.cfm?id=243415&) indicated that there is an opportunity for Washington State to play a critical role in meeting the growing national demand for skilled workforce in energy-related fields. She stated further that both industry and academia are bracing for a critical shortage of engineers in this area. Compounding this issue is that more than one-half of the nation's science and engineering workforce will reach retirement age in the next twenty years. More mechanical engineering graduates in Washington State will allow the state to meet its economic developments goals and to better meet the State's energy needs by providing more engineers to work on future energy sources.

A Washington Technology Center report from February 2003, noted a mixed economic situation with telecommunications still down, but some high technology areas showing renewed growth. The growth in technology employment for the combined Tri-Cities and Spokane metropolitan areas showed a modest but positive grow of 1.3% in a recent statewide report (Index of Innovation and Technology, Washington State, 2003).

Technology companies will be challenged to find the skilled professionals they require when the economy recovers to advance projects that are currently on hold. When companies are able to move forward there will be a rapid turnaround in the number of employment opportunities and EWU Mechanical Engineering graduates must be available.

1.2 Capacity

The College of Science, Health and Engineering at EWU has reorganized and redeveloped the programs in its Departments of Engineering and Design, Computer Science and Physics in response to the current workforce needs particularly as they applied to the regional technology sector. To this end, the faculties of these departments united within an academic unit named the School of Computing and Engineering Sciences where interdependent programs can focus on student learning within the context of the ever-increasing demand for technology connected degrees. Seeing the benefit of a new academic unit at EWU, the Washington State legislature built a new state-of-the-art building to house the school and its programs.

The School's new facility, the Computing and Engineering Building, housing 15 classrooms (one is wired for distance education) and 21 laboratories, with many spaces designed for interaction and collaboration between departments, opened in 2005. With more space (93,000 gross square feet and 60,000 assignable square feet), Eastern now serves more students in the Departments of Engineering & Design and Computer Science than in the past. Laboratories are furnished with the latest equipment giving students the opportunities they need to understand and use these technologies as professionals. Specialized labs and equipment are also helping faculty further their research and foster industry partnerships, with the goal of leading to new technologies and new applications for current technology.

As described above, the new Computing and Engineering Building houses the Department of Engineering and Design. This facility with its leading edge technology will accommodate the new Mechanical Engineering program on the Cheney campus. The new required Mechanical Engineering Laboratories are quite similar to the existing Mechanical Engineering Technology Laboratories. Therefore, the addition of the Mechanical Engineering program will allow multiple uses of these laboratories.

Anticipated students include approximately 25 Juniors with approximately 20 Mechanical Engineering graduates/year on EWU campus. The cost of the program is estimated to be $5000 plus indirects/Full Time Equivalent (FTE) Students, once steady state is reached. Program expenses will include cost of three faculty members, program coordination and support, operational costs, travel, ABET accreditation, equipment, and part-time instructors.

EWU has a high rate of first generation students creating opportunities for underserved students as well.

II. Support of the Statewide Strategic Master Plan for Higher Education

The Statewide Strategic Master Plan for Higher Education states that the Washington State baby boomers (people born between 1946-1964) are the most highly educated generation in history but in many other countries younger generations are more highly educated. We have fallen behind other countries in educational attainment. A goal of the Master Plan is to increase the total number of degrees and certificates produced annually to achieve Global Challenge State benchmarks of 13,800 additional baccalaureate degrees awarded by 2018.

The fourth strategy to raise education attainment is to make college affordable and easy to access. EWU BSME students will have lower tuition than at the research institutions. For those students from the Spokane area who desire a BSME but are placed bound, they will be able to remain in Spokane and obtain a degree.

The Master Plan discusses methods for promoting economic growth and innovation. A 2006 HECB report found shortages of people with baccalaureate degrees in engineering, computer science, medical professions, editing, writing and performing occupations, human and protective service occupations, research, scientific and technical occupations. As a policy goal the Master Plan suggests expansion of bachelor degree programs in science, technology, engineering, mathematics and health sciences. The Master Plan further expresses a need for promotion of student enrollment in STEM fields especially students of the underserved in the STEM field. The underserved in the STEM fields have not fared well in Washington's education system and are a rapidly increasing population. For the past several years, EWU has been very successful in attracting minority students to the Cheney campus. The BSME enrollment plan is committed to increase enrollment of the underserved in engineering.